

DEADLY DENSITY

Have you heard about a substance called chlorine? If you have, you probably know that it is sometimes added to water. Chlorine is added to drinking water to kill harmful microorganisms. When you go swimming, you can smell the chlorine at the pool. That's because chemicals that release chlorine are added to the water to keep it safe for swimming.

You may be surprised to learn that chlorine is a greenish yellow gas. It is also a very poisonous substance. This property is exploited when chlorine is used as a disinfectant to kill microorganisms. In small amounts, chlorine kills microbes but not larger organisms. However, chlorine has also been used to kill people.

In World War I (1914–1918), chlorine was used as a weapon. Most of the battles in this war were fought between lines of trenches that provided the soldiers with some protection against gunfire. On April 22, 1915, at the battle of Ypres, in France, the Germans used a new

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Chlorine is used to kill the microorganisms in swimming pools.

secret weapon. That weapon was chlorine. They released chlorine gas from their side of the lines. The chlorine was carried by the wind to the enemy trenches. Because chlorine is much denser than air, it stayed near the ground and poured into the trenches. Choked and blinded, the defenders were then overrun by German troops wearing gas masks. After this gas attack, soldiers on both sides were issued gas masks. □

QUESTION

What are other properties and uses of chlorine? Use the library and Internet resources to find out more about chlorine.

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To protect themselves against poisonous gases in World War I, these U.S. troops and their mules wore gas masks.

AIR HEADS

What do a scuba diver and an astronaut have in common? They both have air on their minds. Air is something most of us take for granted. We might think about it when we are swimming or exercising, but otherwise we know there is plenty of it around. The air that surrounds our entire planet is called the atmosphere. To an astronaut and a diver, air is something to think about. They have to carry an atmosphere with them: their own supply of air compressed into a small tank. If it runs out, they are in big trouble!

Why do we need air? Sometimes people say, "We need air to breathe." This is the opposite of the truth. In fact, we breathe because we need air—even then, we only need part of it. Air is a mixture of gases. The part we use is called oxygen, and it makes up about one-fifth of normal atmospheric air.

Why is oxygen so important? Our bodies use oxygen to combine with food substances in a process called respiration. Respiration releases energy that we can then use for our body processes (another gas, carbon dioxide, also found in air, is made in this process). If you were deprived of oxygen for more than a few minutes, these life processes would stop. You would suffocate to death!

Oxygen is also needed for things to burn. Think back to what happened in Lesson 1 when you placed a beaker over a burning candle. The candle went out because it had used up most of the oxygen in the air. Things burn very quickly in pure oxygen. In fact, burning things in pure oxygen can be explosive. It's a good thing that air consists mainly of another gas called nitrogen.

From our point of view, nitrogen gas doesn't do very



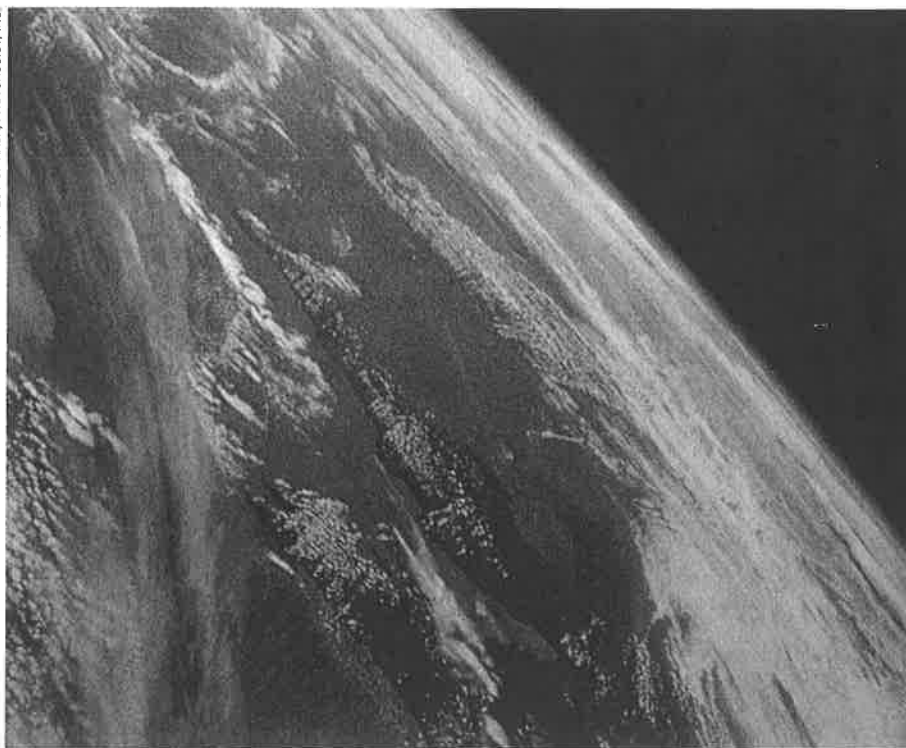
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NASA

What do these two explorers have on their minds?

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A layer of air called the atmosphere surrounds Earth.

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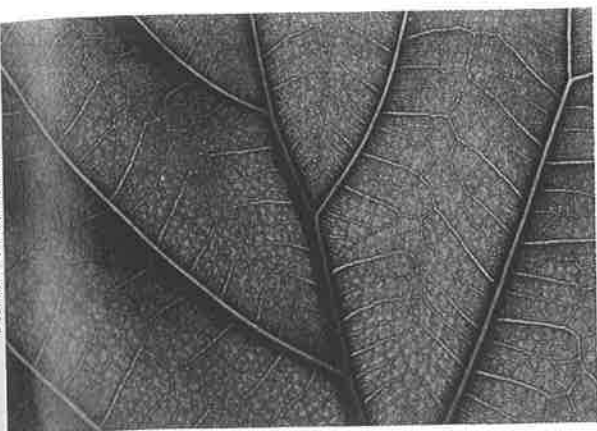
This fierce forest fire would burn explosively if the atmosphere were pure oxygen. Luckily, air consists mainly of less reactive nitrogen.

much. Our bodies don't use it, very few substances react with it, and it's colorless and odorless. Many of the other gases found in air don't do much either. Some of these gases, including argon, neon, and helium, are so renowned for doing nothing that they are called inert gases.

Other gases are more important to living things. Without the 0.03 percent of carbon dioxide in the air, there would be no green plants. Plants use carbon dioxide to make food. They use the energy from sunlight to combine water with carbon dioxide to make carbohydrates. They turn parts of the air into living matter! Most plants absorb water through their roots, but water is also found in the air (it's called water vapor). The amount of water in the form of water vapor varies. On hot, sticky days, you can easily feel that there's a lot of water in the air.

There are other gases in air. Some of these occur naturally;

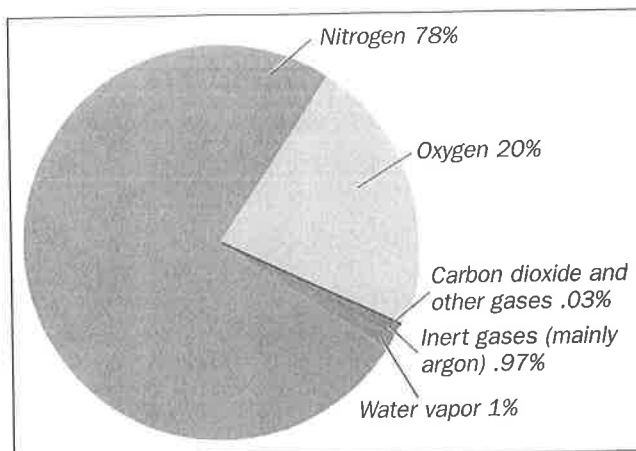
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This leaf is a factory that uses carbon dioxide from the air as a raw material.

others are the result of pollution. In fact, air has a chemistry all its own. You will have the opportunity

to investigate some aspects of the chemistry of air later in the module. □



Air is composed of several different gases. This chart provides a simplified summary of the composition of air.

QUESTIONS

Use library or Internet resources to answer one of the following questions:

1. Where did Earth's atmosphere come from?
2. Has the atmosphere always had the same composition?
3. Is the composition of the atmosphere changing? If so, what are the causes of this change? Write your answer as a paragraph with four to seven sentences.